

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
11 November 2004 (11.11.2004)

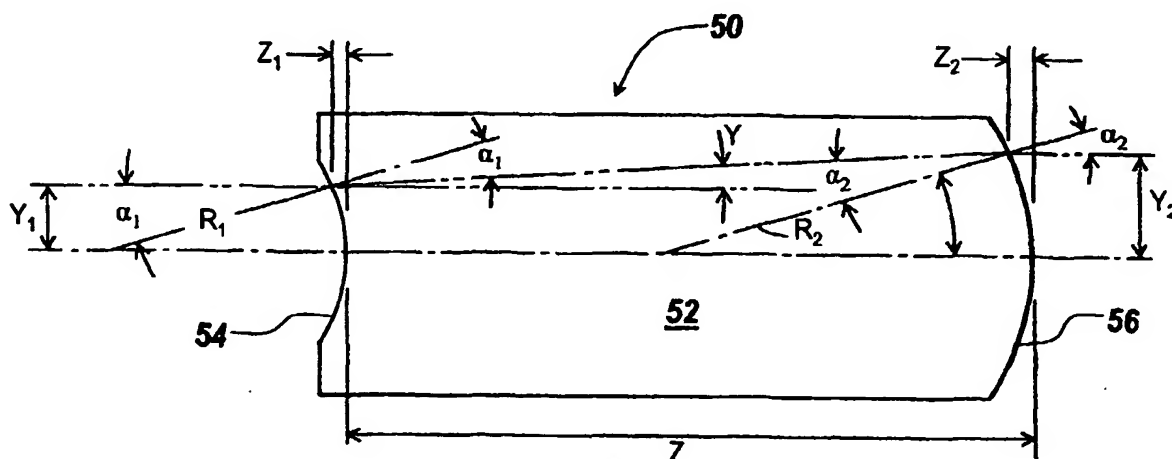
PCT

(10) International Publication Number
WO 2004/097465 A3

- (51) International Patent Classification⁷: **G02C 9/00**, 13/08, 3/02
- (21) International Application Number:
PCT/US2004/005812
- (22) International Filing Date: 26 February 2004 (26.02.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/465,166 24 April 2003 (24.04.2003) US
- (71) Applicant (for all designated States except US): **BAE SYSTEMS INFORMATION AND ELECTRONIC SYSTEMS INTEGRATION INC.** [US/US]; 65 Spit Brook Road NHQ01-719, Nashua, NH 03061 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **KUPPENHEIMER, John, D.** [US/US]; 100 Brookfield Road, Tewksbury, MA 01876 (US). **WING, William, F.** [US/US]; 24 Wesson Road, Ashland, MA 01721 (US).
- (74) Agent: **LONG, Daniel, J.**; Bae Systems Information and Electronic Systems Integration Inc., 65 Spit Brook Road, NHQ01-719, Nashua, NH 03061 (US).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: **SINGLET TELESCOPES WITH CONTROLLABLE GHOSTS FOR LASER BEAM FORMING**



(57) Abstract: A singlet telescope (50) is provided for reshaping the laser beam to a larger or smaller diameter while maintaining the inherent quality of the beam. Applications for the singlet telescope (50) include intercavity expansion to accommodate the damage threshold of various components, expansion of beams to match the size of different wavelengths for final collimation, and shrinking of beams to provide high irradiance for nonlinear processes such as optical parametric oscillation and frequency doubling, with the above applications usually requiring low power magnification or demagnification. Problems involving the utilization of these telescopes over wide temperature ranges and ghost reflections in which a light is reflected back to a pumping laser are minimized with the singlet construction, with the ghost reflections potentially creating damage of components including self-damage or breakdown of air, as well as damage to a Q-switched resonator which causes pre-lasing.



(88) Date of publication of the international search report:
13 January 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/05812

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G02C 9/00, 13/08, 3/02

US CL : 359/719, 668, 796

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 359/718, 719, 668, 796

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-------------|---|------------------------------------|
| X — A | US 6,195,208 B1 (NGOI et al) 27 February 2001 (27.02.2001), col. 1, lines 8-14; col. lines 60-63; Fig. 5. | 1, 6 and 8-12 2-5, 7, 13 and 14 |
| X — A | US 5,181,224 A (Snyder et al) 19 January 1993 (19.01.1993), col. 2, lines 29-31, 62-63; col. 4, lines 2-6; Fig. 3B. | 1, 6 and 8-12 2-5, 7, 13 and 14 |

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

20 August 2004 (20.08.2004)

Date of mailing of the international search report

30 NOV 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Jose Dees

Telephone No. 571-272-1569